



FOUNDATION SKILLS

PATHWAY: All Pathways

COURSE: All CTAE Courses

UNIT: Pi Day: A Real World Application to CTAE



INTRODUCTION

Annotation: This lesson covers the definition and calculation of pi as well as real world applications and uses of pi.

Grade(s):

x	9 th
x	10 th
x	11 th
x	12 th

Time: 50 minutes

Author: Philip Ledford and Dr. Flanders

Additional Author(s): Cynthia Thomas

Students with Disabilities:

For students with disabilities, the instructor should refer to the student's IEP to be sure that the accommodations specified are being provided. Instructors should also familiarize themselves with the provisions of Behavior Intervention Plans that may be part of a student's IEP. Frequent consultation with a student's special education instructor will be beneficial in providing appropriate differentiation.



FOCUS STANDARDS

GPS Focus Standards:

ACCT-AMI-1 Students will demonstrate the ability to perform the following, using appropriate formulas.

- a. Calculate the area of a polygon and/or circle.
- b. Calculate the volume of a sphere, cube, or cylinder.
- c. Perform algebraic operations involving addition, subtraction, multiplication, and/or division of positive and negative numbers

ACCT-AMI-2 Students will demonstrate the ability to perform the following:

- a. Identify parts or systems of an aircraft where Boyle's, Charles' and /or Pascal's Laws apply.
- b. Calculate force, area, or pressure in a specific application.

HS-IBT-1 Students will demonstrate knowledge and understanding of the academic subject matter required for proficiency within their area. Students will demonstrate knowledge in fundamentals of math and statistics concepts, genetics, organic chemistry, biochemistry, cell biology, microbiology and molecular biology.

- b. Apply basic math including metric conversions, time conversions, percentages, and basic statistical concepts.

ENGR-EA2 Students will develop and follow a detailed plan for the solution of a design problem.

- b. Apply mathematical models and calculations necessary to complete predictive analysis.

ENGR-EP-3 Students will differentiate between fluid power systems and apply the laws that govern each.

- d. Solve mathematical problems involving changes in pressure, temperature, and volume in fluid power systems.

AG-VT-18 Students will practice basic math skills including addition, subtraction, multiplication, and division of whole numbers, fractions, and decimals. They will work with percents and averages, as well as liquid and linear measurement. Students will be able to convert English and metric units.

- a. Complete basic addition, subtraction, multiplication, and division problems correctly using whole numbers, fractions, and decimals.
- b. Evaluate a given word problem to identify the important information that will be used in solving the problem.
- c. Operate a calculator correctly.

AG-VT-19 Students will solve word problems illustrating real-life situations using ratios and dimensional analysis. Students will apply their knowledge of basic math to each problem.

- a. Complete advanced ratios dealing with dosage, dilution, and weight conversions correctly.
- b. Complete word problems dealing with percent, temperature conversion, and liquid and linear measurement correctly.
- c. Explain why solid math skills are vital to the success of any veterinary hospital.

GPS Academic Standards:

M5M1 Students will extend their understanding of area of fundamental geometric plane figures.

- a. Estimate the area of fundamental geometric plane figures.
- b. Derive the formula for the area of a parallelogram (e.g., cut the parallelogram apart and rearrange it into a rectangle of the same area).
- c. Derive the formula for the area of a triangle (e.g. demonstrate and explain its relationship to the area of a rectangle with the same base and height).
- d. Find the areas of triangles and parallelograms using formulae.

- e. Estimate the area of a circle through partitioning and tiling and then find the area of a circle with formula (let $\pi = 3.14$). (Discuss square units as they apply to circles.)
- f. Find the area of a polygon (regular and irregular) by dividing it into squares, rectangles, and/or triangles and finding the sum of the areas of those shapes.

M5M4 Students will understand and compute the volume of a simple geometric solid.

- a. Understand a cubic unit (u^3) is represented by a cube in which each edge has the length of 1 unit.
- b. Identify the units used in computing volume as cubic centimeters (cm^3), cubic meters (m^3), cubic inches (in^3), cubic feet (ft^3), and cubic yards (yd^3).
- c. Derive the formula for finding the volume of a cube and a rectangular prism using manipulatives.
- d. Compute the volume of a cube and a rectangular prism using formulae.
- e. Estimate the volume of a simple geometric solid.

SPS5 Students will compare and contrast the phases of matter as they relate to atomic and molecular motion.

- b. Relate temperature, pressure, and volume of gases to the behavior of gases.

SCSh5 Students will demonstrate the computation and estimation skills necessary for analyzing data and developing reasonable scientific explanations.

- e. Solve scientific problems by substituting quantitative values, using dimensional analysis and/or simple algebraic formulas as appropriate.



UNDERSTANDINGS & GOALS

Enduring Understandings: Pi is the mathematical constant whose value is the ratio of all circle's circumference to its diameter. Pi is used in many different formulas. Professions like engineering, construction, and architecture rely on pi extensively in the line of work. Pi day is celebrated on 3/14 because it's first 3 digits are 3.14.

Essential Questions: Why is pi important?
How is pi applied to life outside the classroom?

Knowledge from this Unit:

1. Students will examine the history of pi and its development along with the development of math.
2. Students will learn what pi stands for and how it is used in mathematics.
3. Students will examine applications of pi.
4. Students will relate applications of pi to situations in everyday life.
5. Students will learn of the professions that use pi.
- 6.

Skills from this Unit: • Students will be able to solve mathematical problems involving diameter, circumference and area using pi as well as utilizing basic mathematical skills.



ASSESSMENT(S)

Assessment Method Type: Select one or more of the following. Please consider the type(s) of differentiated instruction you will be using in the classroom.

- Pre-test
- Objective assessment - multiple-choice, true- false, etc.
 - Quizzes/Tests
 - Unit test
- Group project
- Individual project
- Self-assessment - May include practice quizzes, games, simulations, checklists, etc.
 - Self-check rubrics
 - Self-check during writing/planning process
 - Journal reflections on concepts, personal experiences and impact on one's life
 - Reflect on evaluations of work from teachers, business partners, and competition judges
 - Academic prompts
 - Practice quizzes/tests
- Subjective assessment/Informal observations
 - Essay tests
 - Observe students working with partners
 - Observe students role playing
- Peer-assessment
 - Peer editing & commentary of products/projects/presentations using rubrics
 - Peer editing and/or critiquing
- Dialogue and Discussion
 - Student/teacher conferences
 - Partner and small group discussions
 - Whole group discussions
 - Interaction with/feedback from community members/speakers and business partners
- Constructed Responses
 - Chart good reading/writing/listening/speaking habits
 - Application of skills to real-life situations/scenarios
- Post-test

Assessment(s) Title: A Short History of Pi. History of Pi Test. Applying Pi worksheet. Applying Pi worksheet.

Assessment(s) Description/Directions: Students will read a short paper on the history of the number pi. A short test over the information from A Short History of pi and History' of pi power points. A mathematical worksheet with problems that include pi and basic math skills.

Attachments for Assessment(s): A Short History of Pi.doc

fs_2.10_UNIT_PLAN_Applying_Pi_WorkSheet_PL.doc

fs_2.10_UNIT_PLAN_Applying_Pi_WorkSheet_PL.doc



LEARNING EXPERIENCES

Instructional planning: Include lessons, activities and other learning experiences in this section with a brief description of the activities to ensure student acquisition of the knowledge and skills addressed in the standards. Complete the sequence of instruction for each lesson/task in the unit.

Sequence of Instruction

1. Identify the Standards. Standards should be posted in the classroom for each lesson.

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2. Review Essential Questions.

Why is pi important?

How is pi applied to life outside the classroom?

3. Identify and review the unit vocabulary.

Area is a quantity expressing the two-dimensional size of a defined part of a surface

Circumference is the distance around a circle

Diameter is the width of a circle.

Pi is the mathematical constant whose value is the ratio of a circle's circumference to its diameter.

Polygon is geometric figure with three or more sides or angles.

Radius is the distance from the center of a circle to its edge.

Volume is the amount of 3-D space an object takes up.

4. Hand out “A Short History of Pi” paper to students.

5. Present “The Origin and History of Pi” PowerPoint.

6. Handout the test “History of Pi Test” worksheet.

- History of pi test can be completed with or without help from the “A Short History of Pi” handout.

7. Assign “Applying Pi” Worksheet.

Assign the activity “Pi Day Activity Work Sheet.”

- Explain the basic procedures of the worksheet. (Answers and explanations are provided with the ApplyingPi.doc attachment)

8. Present “Ancient Mathematicians for A Day: The calculation of pi” PowerPoint.

- The instructions to the activity are presented in the power point. As you present the power point have the students follow the instructions and repeat them until activity is complete.

Attachments for Learning Experiences: The Origin and History of Pi PowerPoint & Pi Day Activity Work Sheet.

Notes & Reflections: Make sure all students know how to use the formula's to find area, diameter, and circumference before assigning the work sheet.

- All answers are provided in the ApplyingPi.doc attachment.



CULMINATING PERFORMANCE TASK (Optional)

Culminating Unit Performance Task Title:

Culminating Unit Performance Task Description/Directions/Differentiated Instruction:

Attachments for Culminating Performance Task: Please list.



UNIT RESOURCES

Web Resources: <http://www.piday.org/>

<http://ualr.edu/lasmoller/pi.html>

<http://www.math.utah.edu/~alfeld/Archimedes/Archimedes.html>

<http://web.sbu.edu/math/PiDay.html>

Attachment(s): A Short History of Pi.doc (handout). A Short History of Pi.doc (test worksheet) Applying Pi.doc (worksheet)

The Origin and History of Pi.pp (power point) Ancient Mathematicians for A Day: The calculations of pi.pp (power point)

Materials & Equipment: Power Point

What 21st Century Technology was used in this unit:

- | | |
|-------------------------------------|-------------------------|
| <input checked="" type="checkbox"/> | Slide Show Software |
| <input type="checkbox"/> | Interactive Whiteboard |
| <input type="checkbox"/> | Student Response System |
| <input type="checkbox"/> | Web Design Software |
| <input type="checkbox"/> | Animation Software |
| <input type="checkbox"/> | Email |

- | | |
|-------------------------------------|--------------------|
| <input type="checkbox"/> | Graphing Software |
| <input checked="" type="checkbox"/> | Calculator |
| <input type="checkbox"/> | Desktop Publishing |
| <input type="checkbox"/> | Blog |
| <input type="checkbox"/> | Wiki |
| <input checked="" type="checkbox"/> | Website |

- | | |
|-------------------------------------|---------------------------------|
| <input type="checkbox"/> | Audio File(s) |
| <input type="checkbox"/> | Graphic Organizer |
| <input checked="" type="checkbox"/> | Image File(s) |
| <input type="checkbox"/> | Video |
| <input type="checkbox"/> | Electronic Game or Puzzle Maker |